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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/767,330      | 01/30/2004  | Yoshihiko Nagamine   | K2020.0002/P002     | 5218             |

24998 7590 12/23/2005

DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP  
2101 L Street, NW  
Washington, DC 20037

EXAMINER

ARTMAN, THOMAS R

|          |              |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

2882

DATE MAILED: 12/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AC

**Office Action Summary**

Application No.

10/767,330

Applicant(s)

NAGAMINE ET AL.

Examiner

Thomas R. Artman

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 21 November 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>01 November 2005</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Blair (US 5,825,845).

Regarding claims 1 and 17, Blair discloses a patient positioning device for positioning a patient couch (Figs.1 and 2) and method of operation (Fig.6), including:

- a) an X-ray emission device 106,
- b) an X-ray entry device 112 for receiving the X-ray emitted from the emission device and outputting an output signal (arrows in Fig.1) depending upon the received X-ray,
- c) an image information generator for generating second image information regarding a portion of the patient 108 lying across the path 146 of the particle beam by using the output signal outputted from the X-ray entry device (col.6, lines 23-30),
- d) a processing unit (Fig.6) for (col.12, lines 37-44 and 54-62):
- e) setting a first set area including an isocenter with respect to a first image information (DRR) which serves as a reference image prepared beforehand based on image data of a tumor in

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the body of the patient and including the isocenter (col.1, line 59, through col.2, line 7; col.10, lines 2-13; also see steps 402, 404 and 406 of Fig.6),

f) setting a second set area including a position corresponding to the path of the charged particle beam with respect to the second image information (step 416 of Fig.6),

g) executing pattern matching 422 between the first image information in the first set area 404 and the second image information 416 in the second set area within an area of the second image information to extract the second set area having the second image information most similar to the first image information in the first set area, thereby producing information 426 used for positioning the couch 150 (col.3, line 56, through col.4, line 18) based on the extracted second set area (col.11, line 41, through col.13, line 9).

With respect to claim 2, Blair further discloses a couch controller (not shown) for controlling the movement of the couch according to the positioning information.

With respect to claim 3, Blair further discloses that the processing unit executes the pattern matching by using information of a plurality of pixels contained in the first image information in the first set area and information of a plurality of pixels contained in the second image information in the second set area (see at least step 422 of Fig.6).

With respect to claim 4, Blair further discloses that the least squares method is used to produce the positioning information (col.12, lines 19-20).

With respect to claim 19, Blair further discloses that the X-ray emission device is mounted to the particle beam irradiation system such that it can be moved to first and second positions which correspond to being moved into and out of the path 146 of the charged particle beam, respectively, and further where the X-ray emission device emits in the first position (col.6, lines 23-53).

Regarding claim 5, Blair discloses a patient positioning device for positioning a patient couch (Figs.1 and 2), including:

- a) an X-ray emission device 106,
- b) an image information generator for generating second image information regarding a portion of the patient 108 lying across the path 146 of the particle beam by using a signal depending on the X-ray emitted from the X-ray emission device (col.6, lines 23-30),
- c) a display unit 420 (col.11, lines 41-50) for displaying first image information representing a tumor in the body of the patient and serving as a reference image prepared beforehand including the isocenter (col.10, lines 2-13), and the second image information, and
- d) a processing unit (Fig.6) for setting a first set area including the isocenter (steps 406 and 410) with respect to the first image information, setting a second set area including a position corresponding to the path 146 of the charged particle beam with respect to the second image information (step 416), displaying a frame showing the first set area and a frame showing the second set area on the display unit, and
- e) executing pattern matching 422 between a first image information 106 in a first set area and the second image information 416 in a second set area within an area of the second

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image information to extract the second set area having the second image information most similar to the first image information in the first set area (col.12, lines 37-62), thereby producing information 426 used for positioning the couch 150 (col.3, line 56, through col.4, line 18) based upon the extracted second set area.

With respect to claim 6, Blair further discloses that the display unit has first and second display units 130 and 132 for displaying the first and second images.

With respect to claim 7, Blair further discloses that the image information generator has an X-ray transducer 114 for converting the X-rays to visible light and a camera 116 to capture the light and produce the second image information.

With respect to claim 8, Blair further discloses that the image information generator further has a camera 116 that has the semiconductor-based detector structure as claimed.

With respect to claim 9, Blair further discloses that the processing unit executes the pattern matching by using information of a plurality of pixels contained in the first image information in the first set area and information of a plurality of pixels contained in the second image information in the second set area (see at least step 422 of Fig.6).

With respect to claim 10, Blair further discloses that the least squares method is used to produce the positioning information (col.12, lines 19-20).

Regarding claims 11 and 18, Blair discloses a patient positioning device and method for positioning a patient couch (Figs.1, 2 and 6), including:

- a) an X-ray emission device 106,
- b) an image information generator for generating second image information regarding a portion of the patient 108 lying across the path 146 of the particle beam by using a signal depending on the X-ray emitted from the X-ray emission device (col.6, lines 23-30),
- c) a processing unit (Fig.6) for:
  - d) setting a first set area including the isocenter (steps 406 and 410) with respect to the first image information which serves as a reference image prepared beforehand based on image data of a tumor in the body of the patient and including the isocenter (col.10, lines 2-13),
  - e) setting a second set area with respect to the second image information and having substantially the same size as the first set area and including a position corresponding to the path 146 of the charged particle beam with respect to the second image information (steps 416 and 422),
  - f) executing primary pattern matching 422 between a first image information 106 in a first set area and the second image information 416 in a second set area within an area of the second image information to extract the second set area having the second image information most similar to the first information in the first set area (col.12, lines 37-62), and
  - g) executing secondary pattern matching 424 between the first set area and extracted second set area for producing information 426 used for positioning the couch 150 (col.3, line 56, through col.4, line 18; col.12, lines 14-36).

With respect to claim 12, Blair further discloses a couch controller (not shown) for controlling the movement of the couch according to the positioning information.

With respect to claim 13, Blair further discloses that the processing unit executes the pattern matching by using information of a plurality of pixels contained in the first image information in the first set area and information of a plurality of pixels contained in the second image information in the second set area (see at least step 422 of Fig.6).

With respect to claim 14, Blair further discloses that the least squares method is used to produce the positioning information (col.12, lines 19-20).

With respect to claim 15, Blair further discloses that the processing unit outputs information for displaying the first and second image information to a display unit that displays the first and second set areas of the first and second image information.

With respect to claim 16, Blair further discloses that the display unit has first and second display units 130 and 132 for displaying the first and second images.

Regarding claim 20, Blair discloses a particle beam generator (Figs.1 and 2), including:

- a) a particle beam generator (Fig.2),
- b) a particle beam irradiation system 102 for irradiating a charged particle beam supplied by the particle beam generator to a tumor of a patient 108,



- c) a couch 150 for supporting the patient,
- d) a patient positioning device (Fig. 1), including:
  - e) an X-ray emission device 106,
  - f) an X-ray entry device 112 for receiving the X-ray emitted from the emission device and outputting an output signal (arrows in Fig. 1) depending upon the received X-ray,
  - g) an image information generator for generating second image information regarding a portion of the patient 108 lying across the path 146 of the particle beam by using the output signal outputted from the X-ray entry device (col.6, lines 23-30),
  - h) a processing unit (Fig. 6) for (col.12, lines 37-44 and 54-62):
    - e) setting a first set area including an isocenter with respect to a first image information (DRR) which serves as a reference image prepared beforehand based on image data of a tumor in the body of the patient and including the isocenter (col.1, line 59, through col.2, line 7; col.10, lines 2-13; also see steps 402, 404 and 406 of Fig. 6),
    - f) setting a second set area including a position corresponding to the path of the charged particle beam with respect to the second image information (step 416 of Fig. 6),
    - g) executing pattern matching 422 between the first image information in the first set area 404 and the second image information 416 in the second set area within an area of the second image information to extract the second set area having the second image information most similar to the first image information in the first set area, thereby producing information 426 used for positioning the couch 150 (col.3, line 56, through col.4, line 18) based on the extracted second set area (col.11, line 41, through col.13, line 9).

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Regarding claims 21 and 22, Blair discloses a patient positioning device for positioning a patient couch (Figs.1 and 2) and method of operation (Fig.6), including:

- a) an X-ray emission device 106,
- b) an X-ray entry device 112 for receiving the X-ray emitted from the emission device and outputting an output signal (arrows in Fig.1) depending upon the received X-ray,
- c) an image information generator for generating second image information regarding a portion of the patient 108 lying across the path 146 of the particle beam by using the output signal outputted from the X-ray entry device (col.6, lines 23-30),
- d) a processing unit (Fig.6) for (col.12, lines 37-44 and 54-62):
  - e) setting a first set area including an isocenter with respect to a first image information (DRR) which serves as a reference image prepared beforehand based on image data of a tumor in the body of the patient and including the isocenter (col.1, line 59, through col.2, line 7; col.10, lines 2-13; also see steps 402, 404 and 406 of Fig.6),
  - f) setting a second set area including a position corresponding to the path of the charged particle beam with respect to the second image information (step 416 of Fig.6),
  - g) executing pattern matching 422 between the first image information in the first set area 404 and the second image information 416 in the second set area within an area of the second image information to extract the second set area having the second image information most similar to the first image information in the first set area, thereby producing information 426 used for positioning the couch 150 (col.3, line 56, through col.4, line 18) based on the extracted second set area (col.11, line 41, through col.13, line 9).

***Response to Arguments***

Applicant's arguments filed November 21<sup>st</sup>, 2005, have been fully considered but they are not persuasive. Applicants assert that the prior art does not disclose pattern matching, where the prior art reference, Blair, has the human operator pick the locations for determining the positioning offset. The examiner respectfully disagrees.

It is true that Blair teaches the use of a human operator to perform the pattern matching in order to determine the first and second sets of image data, and to extract the second set most similar to the first set (picks out monuments, such as common structural features or fiducial markers, in both images).

However, Blair also discloses in col.12, line 37 through col.13, line 9, that the computer is advantageously used to perform the primary pattern matching, i.e., determining the first set from the first image (having the tumor and isocenter) and extracting the second set from the second image similar to that of the first set, where the second set has the particle beam path. Then, based upon these sets, the computer then performs the secondary pattern matching, using a least squares algorithm, in order to determine how to move the patient couch (col.12, lines 14-36). This is used as a more efficient method than having the human operator perform the primary pattern matching (col.12, lines 63-65).

Therefore, the rejections above stand as claims 1-22 are anticipated by Blair.

*Conclusion*

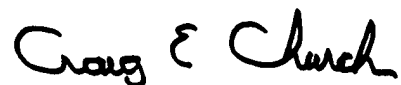
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Alder (US 5,207,223) teaches an active, real-time patient positioning device with X-ray imaging devices for pattern matching between subsequent images in order to reposition the patient couch as necessary. Kunieda (US 6,307,914) teaches a similar active, real-time positioning device to that of Alder, except that the radiation therapy source, not the patient, is moved.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas R. Artman whose telephone number is (571) 272-2485. The examiner can normally be reached on 9am - 5:30pm Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thomas R. Artman  
Patent Examiner



Craig E. Church  
Primary Examiner